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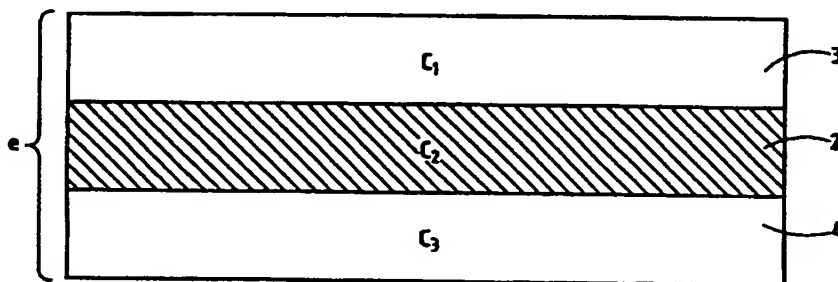
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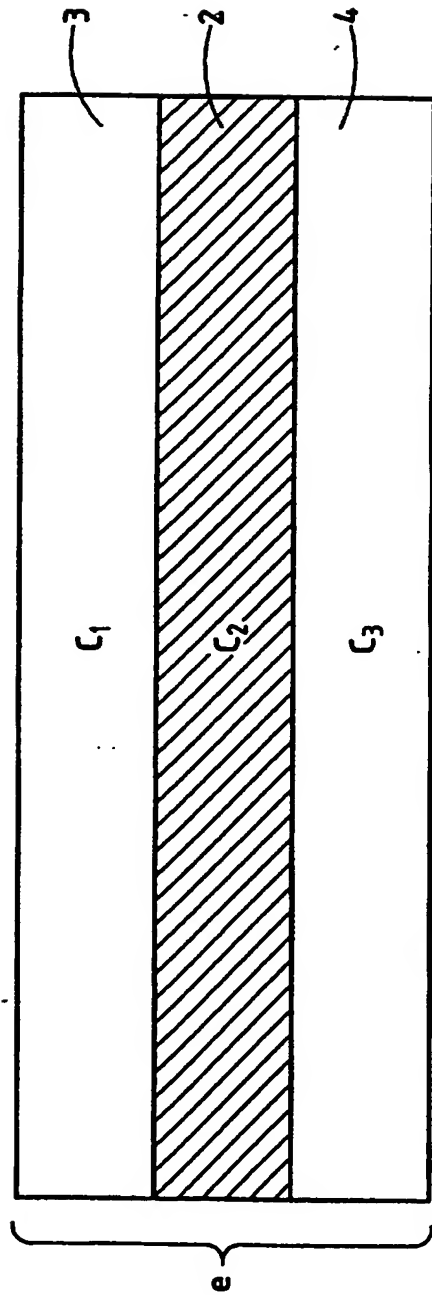
Opaque security paper authenticatable by tearing, e.g. for scratch cards

(57) An opaque security paper authenticatable by tearing, e.g. for use in scratch cards, is made as a single uniform fibrous web of an initial colour (C2) throughout its thickness and is then decolourised or differently coloured on at least one face to form a slice (3,4) which is white or of a different colour to the central slice (2). The colour change may be effected by acting on the original colorant in the paper with an agent, e.g. by treating a metal oxide colorant with a reducing agent, a metal salt with a sequestering agent, a pH indicator with e.g. acid, a redox indicator with an appropriate medium and a dye with a dye degrading agent. The agent may be applied at the size press stage.



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OPAQUE SECURITY PAPER AUTHENTICATABLE BY TEARING, SCRATCH
CARDS MADE FROM SAID PAPER, AND PROCESS FOR ITS MANUFACTURE

5 The present invention relates to so-called security fibrous bases for writing and/or printing, particularly paper bases. These security fibrous or paper bases are useful for making security documents such as admission or travel tickets, checks, legal or official documents, credit documents, insurance certificates, show tickets, train tickets, aeroplane tickets or the like, or else scratch cards, which are also called instant lottery tickets.

10 More precisely, the invention relates to fibrous bases such as security papers which are tamperproof because they can be authenticated by tearing to reveal a multicolored sandwich structure. This method of authentication and of combating counterfeiting is used in currency notes, where high values may be involved.

15 The present invention further relates to security fibrous bases, particularly security papers, which are suitable for writing and printing and which can be used to make scratch cards on which the concealed printed information must not be detectable by see-through, and which also make it possible to avoid another type of fraud by delamination.

20 The direct authentication of a sheet of fibrous base, for example paper base, by tearing makes it possible to reveal a multicolored sandwich structure: *colored inner slice and two white, light or differently colored outer slices*. This characteristic structure provides definite evidence of the authentic origin of certain documents, sometimes of very high value, such as travel tickets, show tickets or the like. Insofar as this technique of authentication by tearing is quick and reliable, it certainly competes with other known systems, such as watermarking, which has existed for a very long time, or else the introduction of security fibers or threads. Some of these known systems (including fluorescent or phosphorescent fibers or dots) have the disadvantage that their authentication requires a detection device. A typical example of such a device is the UV lamp.

25 Consequently, opaque security fibrous or paper bases with a multicolored sandwich structure enabling them to be authenticated by tearing ought not to have any difficulty in gaining preference, especially in tamperproof travel ticket and currency note applications, inasmuch as they eliminate a major drawback, namely the delaminatable character, of the currently existing fibrous or paper bases authenticatable by tearing. This prohibitive drawback is associated with the structure and method of manufacture of these known security fibrous or paper bases.

35 Thus a first type of structure is known in which three layers of paper are

joined together by lamination, the center layer being colored and the outer layers being white.

5 The second known type of structure is formed by a sheet of colored paper which is treated by coating at least one of its faces with a white or opacifying coating composition.

10 The coating of colored bases in the security paper sector was already disclosed a very long time ago, although the stated intention at the time was not to provide papers authenticatable by tearing. Thus US patent no. 1 417 820 describes a process for rendering a paper tamperproof by coating both faces of a black paper with an opaque coating material sensitive to the solvents contained in the ink eradicators which can be used for tampering purposes. Said patent therefore deals with a sandwich structure of the following type: *light-colored coating/black or dark-colored paper/light-colored coating*.

15 The security paper disclosed by British patent no. 1 435 686 is also known in the security paper sector; it is designed to resist attempted fraud by abrasion of the surface in order to remove the printing and writing ink. This security paper comprises a paper base sheet with an opaque abrasion-sensitive coating consisting of a non-metallic pigment (clay or TiO_2) dispersed in a binder (synthetic polymer = vinylic/acrylic-styrene/acrylic-styrene/butadiene copolymer or natural polymer =
20 cellulose-starch-casein). The color of the paper base sheet contrasts with that of the coating so that the abrasion marks in the upper coating can be detected by see-through. Said patent does not teach the following sandwich structure: *light color or white/different or darker color/light color or white*.

25 The coating of a colored paper with an opacifying or white composition is also utilized in the sector of security papers destined for a particular use, namely the production of instant lottery tickets or any other analog of the scratch card type. Such articles contain concealed printed information which can be a number, a symbol or a message possibly resulting in a win, on the one hand, or a security number for preventing counterfeiting, on the other. This information is
30 conventionally concealed by means of a scratch-off opaque coating comprising, for example, a metallic pigment (aluminum) dispersed in a binder formed by a latex of rubber or other hydrocarbon polymers (cf. coating 28 of the lottery ticket described in US patent no. 4 726 608). In addition to this opaque coating, the ticket comprises the following, from top to bottom, on a paper substrate 18: a release
35 coating 26 made of polyamide, a seal coating 25 made of vinyl acetate/maleic acid

copolymer, the printed characters 24, a primer coating made of amorphous silica + vinyl acetate/maleic acid polymer + n-propyl acetate solvent and, finally, an aluminum foil 20 attached to the paper substrate 18.

5 In an attempt to mitigate the disadvantages associated with the presence of the aluminum foil in this type of scratch card, European patent no. 0 428 489 proposes the use of coated paper for the manufacture of such articles. The security paper disclosed by said patent comprises a paper base substrate weighing of the order of 225 g/m^2 , colored with carbon black so as to be totally opaque, and coated with a composition comprising pigments such as clay or titanium dioxide, latex or
10 starch. The faces of the coated paper obtained in this way are white, smooth and uniform and hence printable. These papers are presented as being non-delaminatable. To manufacture an instant lottery ticket, provision is made to print on the faces of the coating and then to apply a final coating of conventional scratch-off colored latex. Said patent therefore discloses a sandwich structure: *white coating/black opaque paper substrate/white coating*.
15

European patent application no. 668 092 discloses an invention relating to papers for instant lottery tickets (scratch cards) which recommends rendering the paper opaque not via the base paper substrate as proposed in European patent no. 428 489, but via an opaque coating applied to said paper base substrate and
20 comprising a pigment of the carbon black type dispersed in a binder of the styrene/butadiene copolymer latex type. Furthermore, this opaque coating is covered with an upper printable coating obtained from a composition comprising styrene/butadiene latex, CaCO_3 and microspheres of styrene-acrylic polymer. FR-A-2 192 211 discloses a process for coloring or dyeing rough-surfaced absorbent
25 paper with a thickness of dye coating which is as small as possible but nevertheless enables an optically uniform coloration to be obtained. Once colored on one face, the paper can be covered with a coating of thermosetting synthetic resin.

To obtain this uniformity of coloration despite the uneven relief of the surface of the absorbent paper in question, this process makes provision for
30 subjecting that face of the paper which is to be colored to a dyeing operation by magnetic calendering or magnetic roller calendering, the aim of which is to deposit the dye in all the hollows and pores, and to a printing operation by rotogravure or flexographic type printing, the aim of which is to ensure that the bosses and the reliefs are colored.

35 According to the teaching of said patent application, only one face of the

paper is colored.

The paper obtained by this process is not homogeneous over its thickness since it has a coating of dye on the surface which, although being as thin as possible, nevertheless exists and makes the paper heterogeneous over its thickness.

5 Furthermore, this colored absorbent paper is not obtained from a single fibrous mat of initial color C_2 and subsequently decolorized or colored differently, at least in part, on at least one of its faces, to form at least one outer slice which is white or has a color $C_1 - C_3$ (different from and/or lighter than the initial color C_2).

FR-A-537 357 relates to improvements to the manufacture of colored
10 boards and papers. More precisely, said French patent discloses laminates comprising a base layer made of board, one or both faces of which are covered with a layer of paper whose surface is colored with the aid of means formed by color reservoirs 10 and by an apparatus 11 for regulating the coatings of color.

In one variant, the board can be colored directly on one of its faces with one
15 or more coatings of color.

Here again, it cannot be disputed that this laminate is not homogeneous over its thickness since it comprises one or more quite separate coatings of color and possibly a layer of paper in addition to the board base layer.

Furthermore, it is clear that the known colored laminate is not obtained by
20 the decolorization or transcolorization of a fibrous continuum of given initial color.

German patent DE 67 632 C relates to a process for coloring one face of a paper substrate, said process being designed so as to avoid migration of the dye from one face to the other of the paper substrate in question, so as to be able to color the two faces independently of one another. In this process, the strip of paper
25 is passed between a heated drying roll of reference X and a coloring roll of reference B. The heat applied by the drying roll X makes it possible to dry the dye rapidly and thus to fix it to the surface of the paper.

This process and the colored paper obtainable thereby do not have the following two characteristics: homogeneity over the thickness (surface coating of
30 dye) and production by the decolorization or transcolorization of a given initial color on at least one of the faces.

It is apparent from this review of the prior art that the known security papers which are authenticatable by tearing and/or sufficiently opaque to be able to be used as bases for instant lottery tickets or scratch cards (absence of see-through)
35 are most often multilayer fibrous bases obtained by the coating technique.

Now, this technique is known to be relatively expensive, especially because of the fact that it has to be carried out most of the time outside the conventional circuit of the paper machine. This clearly detracts from the productivity and viability of the paper manufacturing process. Furthermore, coating is an operation which can very easily be copied by craftsmen. This only increases the risks of counterfeiting.

Moreover, it is obvious that coating does not provide a truly satisfactory solution to the problem of delamination. The persistence, in layered structures, of this problem fundamentally inherent in multilaminate structures is emphasized in European patent application no. 0 668 092, page 2, lines 29 - 30.

Given this situation, one of the essential objects of the present invention is to provide a security fibrous base, particularly a security paper, authenticatable by tearing and capable of constituting an appropriate opaque substrate for the production of scratch cards, which mitigates the disadvantages of the coated security papers according to the prior art.

Another essential object of the invention is to ensure that this security paper meets the following specifications:

- authenticatable by tearing,
- non-delaminatable,
- tamperproof,
- totally opaque so as not to be susceptible to fraud by see-through in scratch cards,
- economic,
- offering good printing and writing qualities,
- not easily copied by craftsmen.

Another essential object of the present invention is to provide a process for the manufacture of a security fibrous base, particularly a security paper, which is authenticatable by tearing, non-delaminatable and totally opaque, it being necessary for said process to be easy to carry out and economic by virtue of its perfect integration into conventional paper production lines.

Another essential object of the present invention is to provide a security paper authenticatable by tearing which consists of the fibrous base referred to above in the objects of the invention.

Another essential object of the present invention is to provide a scratch card produced from the above-mentioned fibrous base.

With these objects in mind, the Applicant successfully demonstrated, after much research and experimentation, that said objects can be achieved by an opaque fibrous base, particularly a paper base, formed by a single homogeneous fibrous network which is initially colored and subsequently converted on its two outer faces, over a certain thickness, by decolorization and/or transcolorization, to give a sandwich structure of the following type:

white outer slice or outer slice of color C_1 /median slice of color $C_2 = \text{or } \neq C_1$ and, optionally, white outer slice or outer slice of color C_1 or C_3 ,

with a light \rightarrow dark color gradient from outside to inside in the case where
 10 $C_1 = C_2 = C_3$.

Consequently the present invention relates to an opaque fibrous base 1, particularly paper, obtained from a single fibrous mat which is:

- \rightarrow homogeneous, especially over its thickness;
- \rightarrow produced from a single fibrous web;
- 15 \rightarrow and initially of color (C_2) and then decolorized or differently colored, at least in part, over at least one of its faces, to form at least one outer slice (3, 4) which is white or has a color (C_1 , C_3) different from and/or lighter than the initial color (C_2).

Such a security fibrous base, in particular a security paper, has the advantage of being non-delaminatable, totally opaque, inexpensive and easily obtainable on a paper machine without the latter being substantially modified.

Furthermore, its industrial character somewhat limits the risks of counterfeiting by craftsmen.

In one variant, the fibrous base is obtained from a single fibrous mat which
 25 is:

- \rightarrow homogeneous, especially over its thickness;
- \rightarrow produced from a single fibrous web;
- \rightarrow and initially of color (C_2) and then decolorized or differently colored, at least in part, over at least one of its faces, to form on the one hand at least one outer slice (3, 4) which is white or has a color (C_1 , C_3) different from and/or lighter than the initial color (C_2), and on the other
 30 hand at least one substantially median slice (2) of color (C_2).

Insofar as the invention relates to security fibrous bases, particularly security papers, authenticatable by tearing, the preferred but non-limiting embodiment of the
 35 invention consequently corresponds to a fibrous base comprising a colored,

substantially median slice, each of whose faces adjoins an outer slice which is white or has a color different from and/or lighter than the median slice, the two outer slices being of the same color or different colors.

It will have been noted here that the structure in question is multicolored, for example bicolored, and of the following sandwich type: *color C₁/color C₂/color C₃*,

where C₁ is identical to or different from C₃, and C₂ is identical to or different from C₁ and C₃,

with the condition that if C₂ = C₁ or C₃, then C₁ or C₃ is lighter than C₂.

This non-delaminatable opaque structure complies perfectly with the specifications referred to above.

The homogeneous and coherent fibrous network structure of the base according to the invention is associated with its formation in a single fibrous web on the paper machine.

The single Figure attached shows a cross-section of such a base according to the preferred embodiment of the invention, purely by way of a non-limiting example.

This Figure shows a base 1 formed of a single fibrous network of thickness *e* comprising, over its thickness, a median slice 2 of color C₂, said slice 2 forming a fibrous structural continuum with the two outer slices 3 and 4 of respective colors C₁ and C₃.

In this example, C₁, C₂ and C₃ correspond to the same basic color, C₁ and C₃ being distinctly lighter than C₂ to the point that they are almost white.

Such a non-delaminatable, bicolored opaque structure is imprinted with a tamperproof indicium corresponding to the color C₂ of the median slice 2, making said structure perfectly authenticatable by tearing.

In one variant of the security fibrous base according to the invention, it is obtained from a fibrous mat which is initially colored and then decolorized, at least in part, over at least one of its two faces, preferably both, to form the two outer slices 3 and 4 situated on either side of the colored median slice 2.

This variant corresponds to the following sandwich structure: *white or very light brown/dark brown/white or very light brown*, which is shown in the single Figure attached and described above. In this variant, the outer/inner color contrast is obtained by means of a decolorizing agent absorbed by the faces of the fibrous base in question, over a thickness which can vary as a function of the ability of said

agent to penetrate into the base.

In another variant, corresponding to the case where C_2 is different from C_1 and/or C_3 , the fibrous base is obtained from a fibrous mat which is initially colored and then differently colored, at least in part, over at least one of its two faces, preferably both, to form the two outer slices 3, 4 situated on either side of the colored median slice 2.

In the first case the colorant reacts with the decolorizing agent, whereas in the second case it reacts with a transcolorizing agent converting C_2 to C_1 and C_3 in the surface layers of the fibrous base 1.

The existence of these two structural variants (inter alia) for the base according to the invention leads to particular constitutional characteristics. Thus the fibrous base comprises at least one colorant and optionally at least one decolorizing agent and/or at least one transcolorizing agent which have not reacted but are capable of reacting with the colorant in the outer slices.

The colorant/decolorizing and/or transcolorizing agent pair is advantageously selected from the following group:

Colorant	Decolorizing and/or transcolorizing agent
metal oxide	reducing agent
metal salt	sequestering agent
pH color indicator	medium of chosen pH
redox color indicator	medium of chosen redox potential
dye	dye degrading agent
and mixtures thereof	

Colored metal oxides or salts, such as iron or manganese salts, can be decolorized by reducing agents or sequestering agents, for example EDTA or monopotassium phosphate.

Without implying a limitation, the following may also be mentioned as other examples of colorant/decolorizing agent pairs:

- metal oxide/reducing agent = copper or cobalt oxide/bisulfite in an acid medium,
 - metal salt/sequestering agent = iron or vanadium salt/ascorbic acid.
- pH color indicators which can be used as colorants can easily be decolorized

by causing the faces of the fibrous mat to be penetrated by a liquid medium whose pH is such as to convert the indicator to a colorless form or a different color. Thus, for example, phenolphthalein, introduced initially into the paper pulp, is brought to a basic pH, causing it to turn pink. Subsequent surface coating of the fibrous mat with an acid converts the phenolphthalein to a colorless form corresponding to an acidic pH.

Phenol red, bromocresol purple or bromophenol blue may be mentioned as other examples of pH indicators which can be used as colorants.

Redox color indicators work according to the same principle as the pH indicators referred to above, except, of course, that the key parameter is not the pH but the redox potential. Methylene blue or neutral red, in combination with Javelle water, may be mentioned as examples of colorant/decolorizing or transcolorizing agent pairs.

Dyes constitute another class of colorants which are suitable according to the invention. In particular, they can be dyes which are capable of being decomposed by oxidizing reagents, for example Javelle water, or else by sulfites, bisulfites, acids, bases, etc.

Dyes with the chemical structure of triphenylmethane, such as DUASYN BLUE FOR BJT INKS from HOECHST, may be mentioned as illustrative examples. This colorant can be associated with decolorizing agents formed by Javelle water and/or a weak base, or else by sodium sulfite.

Cresol red, associated with Javelle water in the decolorizing/transcolorizing bath, may be mentioned as another example of a dye which forms part of the constitution of the fibrous base according to the invention and is capable of reacting with degrading agents to cause a color change.

The following examples will be used to illustrate the variant in which the fibrous base comprises at least one colorant and at least one transcolorizing agent:

* LEVACELL YELLOW 3 GX from BAYER, in combination with a basic solution,

* SAFRANINE O with a solution of Javelle water.

The chemical decolorizing and transcolorizing means can also be complemented or replaced with physical means having the same effects, possible examples being as follows:

- actinic radiation such as UV and/or infrared radiation,
- heat,

- electron bombardment,
- exposure to a laser beam,
- ultrasonic or microwave treatments,
- etc.

5 The security fibrous base according to the invention can also be defined by way of its particular physical characteristics. Thus its weight is advantageously greater than or equal to 80 g/m^2 , preferably between 100 and 400 g/m^2 and particularly preferably between 120 and 300 g/m^2 .

10 The weight of the paper is an important parameter as regards the penetrating ability of the decolorizing/transcolorizing agents. It is important, in fact, that said agents penetrate into the fibrous base over a sufficient thickness for the color change to be apparent, but it is obvious that this penetration must not be too great so as to preserve a dark-colored or differently colored median slice of significant thickness in order to allow authentication by tearing.

15 The penetration of the decolorizing agents can also be controlled by varying the freeness of the fibers constituting the base, and hence its porosity, and also by varying the sizing, i.e. its ability to be subsequently rewetted by the decolorizing/transcolorizing solution.

20 The freeness of the fibrous base will preferably be between 15 and 55° SR (SCHOPPER RIEGLER) and particularly preferably between 30 and 45° SR . It is self-evident that the freeness value will also depend on the weight of the paper. Those skilled in the art are perfectly capable of determining the appropriate values of these two interdependent parameters.

25 As far as sizing is concerned, the agent used can be a conventional rosin size, an alkylketene dimer or any other product which makes it possible to achieve a conventional COBB value for this parameter of between 15 and 30 g/m^2 and more particularly of 16 to 20 g/m^2 .

30 Another important factor concerning the penetrating ability, namely the viscosity of the liquid containing the decolorizing/transcolorizing agents, will be discussed later in the context of the description of the process.

35 Whatever the case may be, these parameters can vary enormously as a function of the weight of the fibrous base in question. In fact, the problem of the penetration of the decolorizing/transcolorizing agents is different for a lightweight base of less than 120 g/m^2 and for a heavier base of more than 200 g/m^2 . In the latter case, even without taking particular precautions in terms of the base, it is very

rare for the decolorizing/transcolorizing solution to penetrate to the core of the sheet and decolorize or change the color of the paper over its total thickness.

According to a preferred provision of the invention, the chosen procedure is to produce a paper or a fibrous base colored on the inside and with reinforced opacity by using an intense colorant capable of forming a dark color (e.g. brown: manganese oxide).

According to the invention, the security fibrous base in question can have any fibrous composition: either purely cellulosic or partly synthetic.

Conventionally the appropriate cellulosic fibers can be deciduous wood fibers, resinous wood fibers or mixtures thereof.

As far as synthetic fibers are concerned, these can be polyester, polyamide or polyolefin fibers, for example.

In practice, the proportion of synthetic fibers relative to the total dry weight of cellulosic + synthetic fibers is of the order of 10 to 30% by weight and preferably 15%.

Advantageously the fibrous base according to the invention can comprise conventional adjuvants used in papermaking, namely:

- mineral or organic fillers such as kaolin, calcium carbonate, talcum, etc.,
- resins or various strengthening agents, particularly for imparting wet strength properties,
- binders of the starch or carboxymethyl cellulose type for improving the mechanical characteristics of papers,
- shading dyes,
- neutral, acidic or basic sizing products (aluminum sulfate for acidic sizing) or pH regulating products,
- etc.

It can also be envisaged, according to the invention, to incorporate additional authenticating agents into the fibrous base, possible examples being security threads, colored or non-colored, fluorescent or non-fluorescent fibers and boards, and tamperproofing agents, for example water-insoluble but organosoluble dyes, in the pigmentary state, so as to protect the writing or printing carried on these fibrous bases from attempted tampering with eradicators comprising organic solvents.

In fact, numerous additives can be included in the fibrous base according to the invention, provided they are not degradable by the decolorizing/transcolorizing

means which have to penetrate into said fibrous base.

According to another of its aspects, the present invention further relates to a process for the manufacture of a fibrous base, particularly a paper base, consisting especially of a single fibrous mat which is homogeneous, especially over its thickness, is opaque and comprises, over its thickness, at least one (preferably one) colored, substantially median slice and at least one (preferably two) outer slice which is white or has a color different from and/or lighter than the median slice, said process consisting essentially in:

- 1 - preparing a fibrous pulp - preferably a paper pulp - incorporating at least one colorant therein,
- 2 - converting this pulp to a base consisting of a single fibrous sheet produced from a single web,
- 3 - removing at least part of the water present in the base-sheet,
- 4 - and decolorizing and/or transcolorizing at least one outer slice of the base-sheet before, during or after the removal of water.

Such a process is one of those which make it possible to obtain the fibrous base forming the above-described first subject of the present invention.

In one preferred mode of carrying out the process, the fibrous base in question (e.g. the paper) has a colored, substantially median slice and, on either side thereof, an outer slice which is white or has a color different from and/or lighter than the median slice. These two outer slices have identical or different colors. In the preferred mode, the decolorization and/or transcolorization is effected by chemical and/or physical means.

Such a fibrous base corresponds to the preferred embodiment of the product according to the invention, as described above and shown in the single Figure attached.

Step 1, which is the preparation of the fibrous pulp, corresponds to a relatively conventional operation in the field of papermaking. On a paper machine, this operation takes place at the headbox or during the preparation of the pulp in the pulper. In the present case, the procedure is simply to add at least one colorant to the pulp and produce a homogeneous mixture.

Step 2 is carried out via the die of the headbox of the paper machine, which makes it possible to produce, from a single web, a fibrous mat containing the colorant, this mat then being fed to the draining module, pressing module and then drying module of the paper machine.

The purpose of these three modules is to perform step 3, which is the removal of the water present in the base-sheet.

5 In the case where chemical decolorization and/or transcolorization is effected, in a preferred mode of carrying out the process according to the invention, step 4 is performed by applying a bath of decolorizing and/or transcolorizing agent with the aid of a device which is preferably provided on the paper machine. Particularly preferably, this coating device is a traditional size press or even a blade metering size press or a gate-roll, said size press usually being located downstream of the predryer section.

10 In the less advantageous case where coating with the bath of decolorizing or transcolorizing agent is effected at the outlet of the paper machine, it is possible to envisage using either on-line coating means, e.g. metal blade or air jet devices, or the traditional printing techniques.

15 It should be pointed out that the conventional means referred to above can be replaced with any suitable means for causing a decolorizing/transcolorizing solution to penetrate into the fibrous base.

It is self-evident that the concentrations of decolorizing/transcolorizing agent used in the coating baths are determined according to the amount of colorant contained in the fibrous base and according to the stoichiometry of the corresponding reaction. These methods of operation are well within the scope of those skilled in the art.

20 As regards the nature of the colorants and decolorizing/transcolorizing agents, reference may be made to the description and definitions given above on this subject in the part of the present disclosure relating to the fibrous bases taken as such.

25 As already indicated previously, the ability of the decolorizing or transcolorizing agent to penetrate into the fibrous base is a fundamental provision of the process according to the invention. The parameters which make it possible to exercise control over this point are on the one hand the weight, the freeness and the sizing of the fibrous base, and on the other hand the viscosity of the coating bath.

30 Thus the viscosity of the decolorizing/transcolorizing solution is adjusted by modifying the solids content and/or using film-forming binders (starch, cellulose, etc.). This viscosity adjustment is effected according to the nature of the decolorizing/transcolorizing reagent and according to its reactivity.

35 It is self-evident that the parameters affecting the penetrating ability of the

decolorizing/transcolorizing agent are interdependent. Thus, the lower the weight of the fibrous base, the greater must be the viscosity of the coating bath.

In practice, it may be indicated by way of example that:

- for a weight of 120 g/m², the viscosity of the bath is advantageously greater than or equal to 100 mPa.s,
- for a weight of 150 g/m², the viscosity is advantageously greater than or equal to 80 mPa.s,
- and for a weight of 200 g/m², the viscosity of the bath is advantageously greater than 30 - 50 mPa.s.

Carboxymethyl cellulose, starch and polyvinyl alcohol, which are natural binders, may be mentioned as examples of water-soluble binders; these are employed preferentially but synthetic binders, such as acrylic or styrene-butadiene latices, are not excluded.

In the case of decolorization/transcolorization by chemical means, the colorant/decolorizing and/or transcolorizing agent pair used in step 4 is advantageously selected from the following group:

Colorant	Decolorizing and/or transcolorizing agent
metal oxide	reducing agent
metal salt	sequestering agent
pH color indicator	medium of chosen pH
redox color indicator	medium of chosen redox potential
dye	dye degrading agent
and mixtures thereof	

In a preferred modality of the process according to the invention:

- the decolorizing/transcolorizing agent is a chemical means,
- the fibrous base is paper manufactured on a paper machine,
- and, to carry out step 4, the decolorizing/transcolorizing agent is applied, inside and/or outside the paper machine, to at least one of the outer faces of the sheet, preferably with the aid of at least one of the following means: size press, rewetting system or coating system.

The present invention further relates to the use of the fibrous base, as defined above and as obtained by the process, for the manufacture of security paper

authenticatable by tearing and of scratch cards or instant lottery tickets.

The present invention thus relates to a security paper authenticatable by tearing, consisting especially of the fibrous base as defined above and/or obtained by carrying out the process as defined above.

5 Finally, the present invention relates to a scratch card consisting especially of the fibrous base as defined above and/or obtained by carrying out the process as defined above.

It is apparent that the fibrous base according to the invention is capable of being a security paper which is authenticatable by tearing, opaque, non-
10 delaminatable, of low cost price and perfectly suitable for application to tamperproof documents authenticatable by tearing, and for application to scratch cards which cannot be tampered with by see-through.

The various Examples below will provide a clearer explanation of the invention without in any way implying a limitation.

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EXAMPLES:

EXAMPLE 1

A color indicator, namely phenolphthalein solubilized in an aqueous-alcoholic medium, is introduced, at a rate of 2% relative to the dry pulp in the mixer, into a
20 paper pulp composed of 50% deciduous woods and 50% resinous woods, which has a freeness of 30° SR and is brought to a pH of 11; an intense pink color develops. A colored base paper weighing 250 g/m² is produced on the paper machine.

Dilute sulfuric acid solution is coated onto the paper in the size press so as to lower
25 the surface pH of the paper and thereby destroy the pinkish red color of the base paper; the final paper obtained is white on the outside and pink at the center.

The paper is authenticatable by tearing.

The bath uptake in the size press is 30% by weight relative to the colored base
30 paper.

EXAMPLE 2

An authenticatable ticket is produced by introducing the dye DUASYN BLUE FOR
BJT INKS from HOECHST into the paper pulp at a rate of 0.2% by weight relative
to the dry pulp; the pH of the pulp is adjusted to 4 with acid.

35 The blue paper thus produced, weighing 300 g/m², arrives at the size press of the

paper machine, where the following bath is applied at a rate of 20% uptake by weight relative to the paper:

Starch: 15% by dry weight relative to the coating bath,

12° Javelle water: 15% by weight, in its original form, relative to the coating bath.

- 5 After drying, the paper is white on the outside and blue on the inside: direct visual authentication can be effected by tearing.

The paper containing this specific dye can also be authenticated at a second level: a line drawn with an ink eradicating felt pen on the colored inner part, or the application of a basic solution thereto, decolorizes this part.

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EXAMPLE 3

A tamperproof ticket is obtained by coating the blue paper base of Example 2 with a bath containing 10% of sodium sulfite relative to the bath, in place of the Javelle water. The same final product is manufactured.

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EXAMPLE 4

A colored paper weighing 200 g/m², acting as a base, is manufactured on a paper machine using the dye LEVACELL YELLOW 3 GX from BAYER; the yellow paper manufactured in this way is coated with dilute caustic soda solution in the size press so as to develop a red coloration on the surface of the paper; as the coloration of the inside of the sheet remains yellow, the paper can be authenticated by tearing.

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However, the paper colored in this way has the disadvantage of being difficult to use by printers in a variety of applications.

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EXAMPLE 5

A base paper weighing 250 g/m², containing manganese oxide at a rate of 3% relative to the dry pulp, has an intense brown coloration.

This base is coated in the size press with a weakly acidic solution of formamidine-sulfinic acid (at a rate of 5% relative to the coating bath) and a high viscosity carboxymethyl cellulose (at a rate of 0.7% by dry weight relative to the coating bath), acting as a binder for the bath.

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The bath uptake in the size press is 30% by weight relative to the base paper.

The final paper is white on the surface and brown-colored at the center.

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Such a paper has a greatly improved opacity, notably it is impossible, even under

strong illumination, to read inscriptions marked on the verso of the paper, whereas a paper of equivalent weight does not have this property.

This white product is printable and can therefore be used as a base paper for instant lottery tickets without it being necessary to laminate it with an aluminum foil in
5 order to prevent see-through.

CLAIMS

1. An opaque fibrous base (1), particularly paper, obtained from a single fibrous mat which is:
 - homogeneous, especially over its thickness;
 - produced from a single fibrous web;
 - and initially of color (C_2) and then decolorized or differently colored, at least in part, over at least one of its faces, to form at least one outer slice (3, 4) which is white or has a color (C_1 , C_3) different from and/or lighter than the initial color (C_2).
2. A fibrous base according to claim 1 obtained from a single fibrous mat which is:
 - homogeneous, especially over its thickness;
 - produced from a single fibrous web;
 - and initially of color (C_2) and then decolorized or differently colored, at least in part, over at least one of its faces, to form on the one hand at least one outer slice (3, 4) which is white or has a color (C_1 , C_3) different from and/or lighter than the initial color (C_2), and on the other hand at least one substantially median slice (2) of color (C_2).
3. A fibrous base according to claim 1 or claim 2 comprising a substantially median slice (2) colored in the initial color (C_2), each of whose faces adjoins an outer slice (3, 4) which is white or has a color (C_1 , C_3) different from and/or lighter than the color (C_2) of the median slice (2), the colors (C_1) and (C_3) of the two outer slices (3) and (4) respectively, situated on either side of the median slice (2), being identical or different.
4. A fibrous base according to claim 1 or 2 comprising at least one colorant and optionally at least one decolorizing agent and/or at least one transcolorizing agent which have not reacted but are capable of reacting with the colorant in the outer slices.
5. A fibrous base according to claim 4 wherein the colorant/decolorizing and/or transcolorizing agent pair is selected from the following group:

Colorant	Decolorizing and/or transcolorizing agent
metal oxide	reducing agent
metal salt	sequestering agent
pH color indicator	medium of chosen pH
redox color indicator	medium of chosen redox potential
dye	dye degrading agent
and mixtures thereof	

6. A fibrous base according to any one of claims 1 to 5 whose weight is greater than or equal to 80 g/m², preferably between 100 and 400 g/m² and particularly preferably between 120 and 300 g/m².
7. A process for the manufacture of a fibrous base (1), particularly a paper base, consisting especially of a single fibrous mat which is homogeneous, especially over its thickness, is opaque and comprises, over its thickness, at least one (preferably one) substantially median slice (2) colored in an initial color (C₂), and at least one (preferably two) outer slice (3, 4) which is white or has a color (C₁, C₃) different from and/or lighter than the median slice (2), said process consisting essentially in:
- 1 - preparing a fibrous pulp - preferably a paper pulp - incorporating at least one colorant therein,
 - 2 - converting this pulp to a base consisting of a single fibrous sheet produced from a single web,
 - 3 - removing at least part of the water present in the base-sheet,
 - 4 - and decolorizing and/or transcolorizing at least one outer slice (3, 4) of the base-sheet before, during or after the removal of water.
8. A process according to claim 7 wherein the fibrous base in question (e.g. the paper) has a substantially median slice (2) of color (C₂) and, on either side thereof, an outer slice (3, 4) which is white or has a color (C₁, C₃) different from and/or lighter than the median slice (2), the colors (C₁, C₃) of these two outer slices (3, 4) being identical or different.
9. A process according to claim 8 wherein, in the case of decolorization/transcolorization by chemical means, the colorant/decolorizing and/or transcolorizing agent pair used is selected from the following group:

Colorant	Decolorizing and/or transcolorizing agent
metal oxide	reducing agent
metal salt	sequestering agent
pH color indicator	medium of chosen pH
redox color indicator	medium of chosen redox potential
dye	dye degrading agent
and mixtures thereof	

10. A process according to any one of claims 7 to 9 wherein the decolorizing/transcolorizing agent is a chemical means, the fibrous base is paper manufactured on a paper machine, and the decolorizing/transcolorizing agent is applied, inside and/or outside the paper machine, to at least one of the outer faces of the sheet, preferably with the aid of at least one of the following means: size press, rewetting system or coating system.

11. A security paper authenticatable by tearing, consisting especially of the fibrous base according to any one of claims 1 to 6 and/or obtained by carrying out the process according to any one of claims 7 to 10.

12. A scratch card consisting especially of the fibrous base according to any one of claims 1 to 6 and/or obtained by carrying out the process according to any one of claims 7 to 10.



The Patent Office

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Application No: GB 9800846.9
Claims searched: 1-12

Examiner: Alex Littlejohn
Date of search: 6 April 1998

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.P): D1R (RBX)

Int CI (Ed.6): A63F; B42D; D21H

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB2235157A (Aussedat) see e.g. e.g. examples	1-3,6-8, 10-12
X	GB1435686 (Culter Guard Bridge) see e.g. page 1 lines 32-43 and 58,59	1-3,6-8, 10-12
X	EP0668092A1 (Wiggins Teape) see e.g. page 3 lines 28-35	1-3,6-8, 10-12
X	DE0067632A1 (Hoesch) see whole document	1,2,6,7, 10-12
X	FR2192211 (Goldschmidt) see whole document	1-3,6-8, 10-12
X	US4786532 (Brown) see whole document	1,2,6,7, 10-12
X	US4556625 (Lenox) see e.g. col 3 lines 38-61, col 4 lines 51-53 and Examples	1-3,6-8, 10-12
X	US4051295 (Bernstein) see e.g. col 2 line 55 - col 3 line 29	1-3,6- 8,10-12

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